AMENDMENTS TO THE CLAIMS

1. (original) A color conversion device for performing pixel-by-pixel color conversion from a first set of three color data representing red, green and blue, or cyan, magenta and yellow, into a second set of three color data representing red, green and blue, or cyan, magenta, and yellow, said device comprising:

first calculation means for calculating a minimum value α and a maximum value β of said first set of three color data for each pixel;

hue data calculating means for calculating hue data r, g, b, y, m and c based on said first set of three color data, and said minimum and maximum values α and β outputted from said calculating means;

means for generating first comparison-result data based on the hue data outputted from said hue data calculating means;

means for generating second comparison-result data based on said first comparison-result data;

coefficient storage means for storing matrix coefficients for the hue data, the first comparison-result data and the second comparison-result data;

coefficient setting means for setting specified coefficients in said coefficient storage means; and

second calculation means responsive to said hue data, said first comparison-result data, said second comparison-result data, and the coefficients from said coefficient storage means for calculating said second set of three color data representing red, green and blue, or cyan, magenta, and yellow,

said second calculation means performing calculation including matrix calculation performed at least on said hue data, said first comparison-result data, said second comparison-result data, and the coefficients from said coefficient storage means.

2. (original) The color conversion device according to claim 1, wherein said second calculation means performs said matrix calculation on said hue data, said first comparison-result data, said second comparison-result data, and the coefficients from said coefficient storage means, and further includes synthesizing means for adding said minimum value α from said first calculation means to the results of said matrix calculation.

3. (currently amended) The color conversion device according to claim 2, wherein

said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 12), and

said second calculation means performs the calculation using

the hue data, ~~said~~ said first comparison-result data, said second comparison-result data, said minimum value α from said calculating means, and said matrix coefficients to determine said second set of three color data representing red, green and blue, denoted by Ro, Go and Bo, in accordance with the following formula (1):

$$\begin{bmatrix} Ro \\ Go \\ Bo \end{bmatrix} = (\mathrm{Eij}) \begin{bmatrix} r \\ g \\ b \end{bmatrix} + (\mathrm{Fij}) \begin{bmatrix} h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \end{bmatrix} + \begin{bmatrix} \alpha \\ \alpha \\ \alpha \end{bmatrix} \qquad \ldots(1)$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

4. (currently amended) The color conversion device according to claim 2, wherein

said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 12), and

said second calculation means performs the calculation using

the hue data, ~~said~~ said first comparison-result data, said second comparison-result data, said minimum value α from said calculating means, and said matrix coefficients to determine said second set of three color data representing cyan, magenta and yellow denoted by Co, Mo and Yo, in accordance with the following formula (2):

$$\begin{bmatrix} Co \\ Mo \\ Yo \end{bmatrix} = (\mathrm{Eij}) \begin{bmatrix} c \\ m \\ y \end{bmatrix} + (\mathrm{Fij}) \begin{bmatrix} h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \end{bmatrix} + \begin{bmatrix} \alpha \\ \alpha \\ \alpha \end{bmatrix} \qquad \ldots(2)$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

5. (original) The color conversion device according to claim 1, wherein said second calculation means performs said matrix calculation on said hue data, said first comparison-result data, said second comparison-result data, the coefficients from said coefficient storage means, and said minimum value α from said first calculation means.

6. (currently amended) The color conversion device according to claim 5, wherein

said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 13), and

said second calculation means performs the calculation using the hue data, ~~said~~ said first comparison-result data, said second comparison-result data, said minimum value α from said calculating means, and said matrix coefficients to determine said second set of three color data representing red, green and blue, denoted by Ro, Go and Bo, in accordance with the following formula (3):

$$\begin{bmatrix} Ro \\ Go \\ Bo \end{bmatrix} = (\mathrm{Eij}) \begin{bmatrix} r \\ g \\ b \end{bmatrix} + (\mathrm{Fij}) \begin{bmatrix} h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \\ \alpha \end{bmatrix} \quad \ldots(3)$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

7. (currently amended) The color conversion device according to claim 5, wherein

said coefficient storage means outputs predetermined matrix coefficients Eij (i = 1 to 3, j = 1 to 3), and Fij (i = 1 to 3, j = 1 to 13), and

said second calculation means performs the calculation using the hue data, ~~said~~ said first comparison-result data, said second comparison-result data, said minimum value α from said calculating means, and said matrix coefficients to determine said second set of three color data representing cyan, magenta and yellow denoted by Co, Mo and Yo, in accordance with the following formula (4):

$$\begin{bmatrix} Co \\ Mo \\ Yo \end{bmatrix} = (Eij) \begin{bmatrix} c \\ m \\ y \end{bmatrix} + (Fij) \begin{bmatrix} h1r \\ h1g \\ h1b \\ h1c \\ h1m \\ h1y \\ h2ry \\ h2rm \\ h2gy \\ h2gc \\ h2bm \\ h2bc \\ \alpha \end{bmatrix} \quad \ldots(4)$$

wherein h1r, h1g, h1b, h1c, h1m and h1y denote said first comparison-result data, and h2ry, h2rm, h2gy, h2gc, h2bm and h2bc denote said second comparison result data.

8. (original) The color conversion device according to claim 1, wherein

said first set of three color data represent red, green and blue,

said second set of three color data represent red, green and blue, and

said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

$r = Ri - \alpha$,

$g = Gi - \alpha$,

$b = Bi - \alpha$,

$y = \beta - Bi$,

$m = \beta - Gi$, and

$c = \beta - Ri$,

wherein Ri, Gi and Bi represent said first set of three color data.

9. (original) The color conversion device according to claim 1, wherein

said first set of three color data represent cyan, magenta and yellow,

said second set of three color data represent red, green and blue,

said device further comprises means for determining complement of said first set of three color data, and

said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

$r = Ri - \alpha$,

$g = Gi - \alpha$,

$b = Bi - \alpha$,

$y = \beta - Bi$,

$m = \beta - Gi$, and

$c = \beta - Ri$,

wherein Ri, Gi and Bi represent data produced by the determination of the complement of said first set of three color data.

10. (original) The color conversion device according to claim 1, wherein

said first set of three color data represent cyan, magenta and yellow,

said second set of three color data represent cyan, magenta and yellow, and

said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

$r = \beta - Ci$,

g = ß - Mi,

b = ß - Yi,

y = Yi - α,

m = Mi - α, and

c = Ci - α.

wherein Ci, Mi and Yi represent said first set of three color data.

11. (original) The color conversion device according to claim 1, wherein

said first set of three color data represent red, green and blue,

said second set of three color data represent cyan, magenta and yellow,

said device further comprises means for determining complement of said first set of three color data, and

said hue data calculation means calculates the hue data r, g, b, y, m, c by subtraction in accordance with:

r = ß - Ci,

g = ß - Mi,

b = ß - Yi,

y = Yi - α,

m = Mi - α, and

$c = Ci - \alpha$.

wherein Ci, Mi and Yi represent data produced by the determination of the complement of said first set of three color data.

12. (original) The color conversion device according to claim 1, wherein

said first comparison-result data generating means determines the comparison-result data among the hue data r, g and b, and the comparison-result data among the hue data y, m and c, and

said second comparison-result data generating means comprises multiplying means for multiplying the first comparison-result data outputted from said first comparison-result data generating means with specific calculation coefficients, and means for determining the comparison-result data based on the outputs of said multiplication means.

13. (original) The color conversion device according to claim 12, wherein

said first comparison-result data generating means determines the first comparison-result data:

$h1r = \min(m, y)$,

$h1g = \min(y, c)$,

$h1b = \min(c, m)$,

h1c = min (g, b),

h1m = min (b, r), and

h1y = min (r, g),

(with min (A, B) representing the minimum value of A and B),

said second comparison-result data generating means determines the second comparison-result data:

h2ry = min (aq1*h1y, ap1*h1r),

h2rm = min (aq2*h1m, ap2*h1r),

h2gy = min (aq3*h1y, ap3*h1g),

h2gc = min (aq4*h1c, ap4*h1g),

h2bm = min (aq5*h1m, ap5*h1b), and

h2bc = min (aq6*h1c, ap6*h1m).

14. (original) The color conversion device according to claim 12, wherein

said multiplying means in said second comparison-result data generating means performs calculation on said first comparison result-data and said calculation coefficients by setting said calculation coefficients aq1 to aq6 and ap1 to ap6 to integral values of 2^n, with n being an integer, and by bit shifting.

15. (original) The color conversion device according to claim 1, wherein each of said first comparison-result data is determined from two of the hue data and is effective for only one of the six

hues of red, green, blue, cyan, magenta and yellow.

16. (original) The color conversion device according to claim 1, wherein each of said second comparison-result data is determined from two of the first comparison-result data and is effective for only one of the six inter-hue areas of red-yellow, yellow-green, green-cyan, cyan-blue, blue-magenta, and magenta-red.

17. (original) The color conversion device according to claim 1, wherein

said coefficient storage means outputs specified matrix coefficients Eij (i = 1 to 3, j = 1 to 3) based on a formula (5) below:

$$(Eij)\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix} \quad \ldots(5)$$

18. (original) The color conversion device according to claim 1, wherein

said first calculation means calculates a maximum value β and a minimum value α using said first set of three color data, and generates an identification code indicating the hue data which is of a value zero, and

said coefficient storage means outputs said matrix

coefficients based on the identification code outputted from said first calculation means, and

said second calculation means performs matrix calculation using the coefficient from said coefficient storage means to produce said second set of three color data based on the identification code outputted from said first calculation means.

19. (original) A method of manufacturing a color conversion device which is for use with an input or output device and which performs pixel-by-pixel color conversion from a first set of three color data representing red, green and blue, or cyan, magenta and yellow, into a second set of three color data representing red, green and blue, or cyan, magenta, and yellow, said color conversion device comprising:

first calculation means for calculating a minimum value α and a maximum value β of said first set of three color data for each pixel;

hue data calculating means for calculating hue data r, g, b, y, m and c based on said first set of three color data, and said minimum and maximum values α and β outputted from said calculating means;

means for generating first comparison-result data based on the hue data outputted from said hue data calculating means;

means for generating second comparison-result data based on said first comparison-result data;

coefficient storage means for storing coefficients for the hue data, the first comparison-result data and the second comparison-result data; and

second calculation means responsive to said hue data, said first comparison-result data, said second comparison-result data, and the coefficients from said coefficient storage means for calculating said second set of three color data representing red, green and blue, or cyan, magenta, and yellow,

A1

said second calculation means performing calculation including matrix calculation performed at least on said hue data, said first comparison-result data, said second comparison-result data, and the coefficients from said coefficient storage means, said method comprising the steps of:

(a) producing a device which includes the above-recited elements, but in which said coefficients are not stored in said storage means; and

(b) writing said coefficients in said coefficient storage taking into consideration the characteristics of the device with which the color conversion device is to be used.

20. (new) A color conversion device for performing pixel-by-pixel color conversion from a first set of three color data representing

red, green and blue, or cyan, magenta, and yellow, into a second set of three color data representing red, green and blue, or cyan, magenta, and yellow, said device comprising:

a coefficient storage for storing matrix coefficients;

coefficient setting means for setting the matrix coefficients in said coefficient storage;

a first calculation term generator for generating a plurality of first calculation terms, each of which is effective for just one of the hues of red, green, blue, cyan, magenta and yellow;

a second calculation term generator for generating a plurality of second calculation terms, each of which is effective for just one of the inter-hue regions between the six hues of red, green, blue, cyan, magenta and yellow; and

a matrix calculator for performing calculation including matrix calculation using the matrix coefficients stored in said coefficient storage, and said second calculation terms.

21. (new) The color conversion device according to claim 20, wherein said second calculation term generator generates each of the second calculation terms using at least two of the first calculation terms.

22. (new) The color conversion device according to claim 20, further comprising a tone converter for converting the tone characteristics of the color data obtained by said matrix

calculator to generate said second set of color data.

23. (new) The color conversion device according to claim 21, further comprising a hue data calculator for calculating hue data r, g, b, c, m and y based on said first set of three color data,

wherein said first calculation term generator generates each of the first calculation terms based on two or more of the six hue data.

24. (new) The color conversion device according to claim 23, wherein said first calculation term generator generates, as each of said first calculation terms, first comparison-result data obtained by determining a first minimum value of two of the hue data.

25. (new) The color conversion device according to claim 24, wherein said second calculation term generator includes:

multipliers respectively multiplying the first comparison-result data by calculation coefficients; and

a minimum value selector for generating, as second comparison-result data, a second minimum value of the results of the multiplication by said multipliers; and

said second calculation term generator uses said second minimum value as said second calculation term.

26. (new) The color conversion device according to claim 23, further comprising:

a maximum and minimum calculator for calculating a maximum, value ß and a minimum value α of the first set of color data,

wherein said hue data calculator determines the hue data based on the first set of color data and the maximum and minimum values.

27. (new) The color conversion device according to claim 26, wherein said calculator also uses said minimum value in the matrix calculation.

28. (new) The color conversion device according to claim 26, wherein said calculator adds said minimum value to the result of the matrix calculation.